PATENT SPECIFICATION

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Complete Specification Accepted: Aug. 19, 1938.

COMPLETE SPECIFICATION

Improvements in Pivots for the Connection of Relatively Movable Parts

I, HANS HOFFMANN, a German Citizen, of Neuendorferstrasse 30, Berlin-Spandau, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to pivots or journals which are fixed relatively to one of two members and movable relatively to the other, e.g. to pins which are fixed in the fork of a connecting rod and pivotal relatively to the piston rod of an engine, to crank-pins fixed to the crank webs of a crank and rotatable in the big-end bearing of the connecting rod, to the journals or shafts fixed between adjacent cranks of a crank shaft and rotatable in the main bearings of an engine, to journal pins or axles which may be fixed to brackets and having a wheel or roller mounted thereon, or which may be rotatable in such brackets with the wheel fixed thereon. For the sake of brevity such pivots, journals, pins, axles and the like will be referred to in the following Specification and Claims as "pivots."

Pivots have hitherto usually been constructed massively. Hollow cylindrical or hollow conical, self-tightening fitting pins, fitting bushes, fitting shafts, and other pivots are also known, however, which are driven into the bores of the machine parts to be connected with an initial stress or compression. If this type of hollow cylindrical or hollow conical self-tightening pivot is used as a pivot for connecting relatively movable parts and is driven directly into the bores of the parts to be connected with said initial compression, there exists the danger that the pivot, which may for example be slotted, may expand or swell in the part situated, for instance, between the link fork and forming the movable part and may thus be pressed tightly against the wall of the hole of the movable part arranged between the fork and thus prevent movement thereof. In addition, on driving the pivot with initial compression into the bores of the parts to be connected, the surfaces of the bores in the parts to be joined can easily be damaged. The danger of damage to the bores of the parts to be connected exists to the same extent also in withdrawing the pivot.

The present invention provides a pivot for the connection of a relatively movable part employing the known slotted self-tightening fitting pins or the like but in which however, the drawbacks of the pivots hitherto usual are avoided, while at the same time retaining the automatic resilient frictional fastening in the part relatively to which the pivot is fixed. The new pivot is characterised in that it consists of a slotted hollow bush or shell to be inserted without any initial compression in the bores of the relatively movable parts, and of one or more self-tightening inner hollow bolts, pins, bushes or the like, to be driven with pre-stress or initial compression into the outer bush or shell which cause the latter to expand.

This means that the outer hollow shell is introduced without radial compression while the inner hollow bolt which serves to lock the outer bush or shell to the part relatively to which it is fixed can only be introduced into the outer hollow shell, after corresponding radial compression.

Since the bores of the parts to be joined only come into contact with the outer hollow bush or shell and since this element is inserted into the bores without any pre-stressing thereof damage to the wall of the bore and to the surface of the parts to be joined is rendered very unlikely.

Furthermore, neither during the insertion of the outer hollow element, which takes place without pre-stressing, nor on driving in the inner tightening element with pre-stressing can an excessive swelling or expansion of the outer element occur in the zone of the journal or bearing surface thereof. Any small swelling of the outer hollow element which may occur on driving in the tightening element can be further reduced or completely avoided, if according to the invention the outer hollow element possesses a greater wall strength than the inner tightening element, or if the inner tightening element is expanded or swelled a little in

the end parts corresponding to the relatively fixed seats thereof, or if instead of a comparatively long inner tightening element two short tightening elements, which are only to be arranged in the zone of the relatively fixed seats are used if necessary with comparatively greater wall strength.

The outer and inner hollow elements can be constructed as desired as far as details are concerned. While the inner tightening elements consist preferably of spring steel, any desired material may be used for the outer hollow elements.

The invention is more particularly described with reference to the accompanying drawings which show several forms of construction by way of example and in which:—

Figs. 1 and 2 illustrate the disadvantages arising on driving a hollow self tightening pivot directly into the bores of the parts to be connected.

Figs. 3 to 12 show in side elevation and in rear elevation some of the various constructions which may be adopted for the outer hollow bush or shell.

Figures 13 to 19 show examples of construction of the inner tightening element.

Figures 20 to 23 show two constructions of the new pivot in their assembled position.

If hollow cylindrical or hollow conical pivots *e* are driven with an initial stress or compression into the bores of parts to be connected (in Figure 1 into the bores of the arms *a* and *b* of a link fork), then the pivot is swelled or expanded in the manner shown in the seat of the movable part located between the parts *a* and *b*. If a swinging lever *c* is arranged between the arms *a* and *b* of the link fork, the pivot *e* is thus pressed tightly on to the wall of the bore not only in the fixed seats *a* and *b*, but also in the part located between them, and thus in most cases the movable part becomes fixed. Furthermore, on driving in the pivot with initial compression, the walls of the bores and the surfaces of the parts *a*, *b*, and *c* to be connected are often damaged.

These drawbacks are obviated, according to the invention by employing a slotted hollow bush or shell *f* to be inserted without pre-compression in the bores of the parts *a*, *b* and *c* to be connected and one or more hollow tightening bolts, pins, bushes or the like *l* to be driven into the elements *f* with pre-compression and which resiliently press the element *f* in the fixed seats *a* and *b* on to the wall of the bore. In Figures 20 to 23 two examples of construction of the new pivot are illustrated in assembled positions.

In the construction of Figures 20 and 21, the outer hollow element *f* which is provided with a longitudinal slit running through it possesses a greater length and a somewhat greater wall strength than the inner tightening element *l* which for example according to Figs. 13 and 14 consists of a longitudinally slotted tube *l* of highly resilient steel which is somewhat expanded at the end parts. The hollow cylindrical or if necessary the inner hollow tightening element can also however, according to Figs. 17, 18, and 19, consist of a strip rolled into S form (Fig. 17), or of a ribbed or fluted tube *o* (Fig. 18) or of a rolled steel strip *m* which overlaps spirally at the edges (Fig. 19) or can be constructed in any other way desired. In the example of construction shown in Figs. 22 and 23, in the place of a comparatively long inner tightening element, two thick-walled short cylindrical tightening elements *p* are provided which only project inwards a short distance between the fixed seats *a* and *b* of the pivot and which thus render impossible a swelling of the outer hollow element in the zone of the movable seating.

Figs. 15 and 16 show short tightening elements of this type as a separate illustration.

The outer hollow element forming the other part of the new pivot can, as to details, be constructed as desired. It must merely be so constructed that on driving in one or more inner tightening elements, it is expanded or extended to the necessary degree and receives a firm seating at the parts *a* and *b* under the influence of the inner tightening element.

In the construction according to Fig. 3 and 4, the outer hollow element consists of a tube with a closed longitudinal slit going through i.e. the opposite walls of the slit contact with one aonther. According to Figs. 5 and 6, the slit in the element *g* is of helical form. Figs. 7 and 8 show a construction *h* of the outer hollow element similar to Figs. 20 to 22 in which the helically curved slot is broadened in the middle part to form a lubricating aperture. In the examples of construction shown in Fig. 9 and 10, the outer hollow element *i* is constructed similarly as the inner tightening element in Fig. 19. Figs. 11 and 12 show an outer hollow element *k* which is only slotted at the end parts corresponding to the fixed seatings of the pivot.

The invention is naturally not confined to the construction shown of outer and inner hollow elements, and it will be but appreciated that these can be altered in varying ways. It is a first essential for the invention that the outer slotted hollow element is to be inserted in the bores of

the relatively movable parts without pre-compression and one or more self tightening inner hollow elements are to be driven into the outer element with a pre-compression.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A pivot for connecting relatively movable parts comprising a slotted hollow outer bush or shell to be inserted without pre-stressing or pre-compression into the bores of the parts to be connected and one or more inner hollow tightening bolts, pins, bushes or the like to be driven into the outer hollow element with pre-stressing or compression and adapted to extend or expand such outer element.

2. A pivot as claimed in Claim 1, in which the outer hollow element has a greater wall strength than the inner hollow element.

3. A pivot as claimed in Claim 1, in which the outer hollow element has a closed slit or slot.

4. A pivot as claimed in Claim 1 or 3, which the outer hollow element has a helical slit therein.

5. A pivot as claimed in Claim 1, 3 or 4, in which the slit in the outer hollow element is enlarged in the zone of the journal or bearing surface thereof to form a lubricating slot.

6. A pivot as claimed in Claim 1, in which the outer hollow element is only slotted in the zone of the fixed seating of the joint.

7. A pivot as claimed in Claim 1, in which the tightening inner hollow element is shorter than the outer hollow element.

8. A pivot as claimed in Claim 1, in which the self-tightening inner hollow element has a somewhat larger diameter at the end parts than at the middle part thereof.

9. A pivot as claimed in Claim 8 in which the inner hollow element is extended or expanded slightly conically at the end parts thereof.

10. A pivot as claimed in Claim 1, in which the inner hollow element consists of two separate elements which expand or enlarge the outer hollow element only in the zone of the fixed seatings of the joint.

11. Pivots for connecting relatively movable parts as particularly described with reference to the accompanying drawings.

Dated this 23rd day of August, 1937.

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12, Church Street, Liverpool,
Chartered Patent Agents.

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Fig. 1

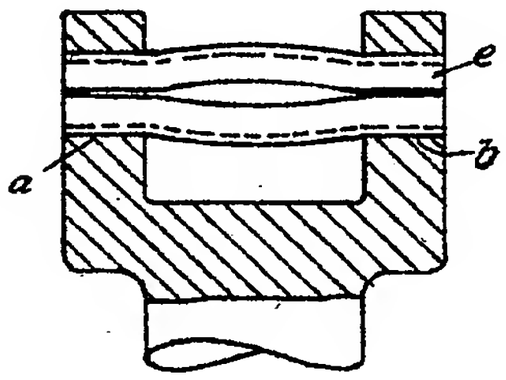

Fig. 2

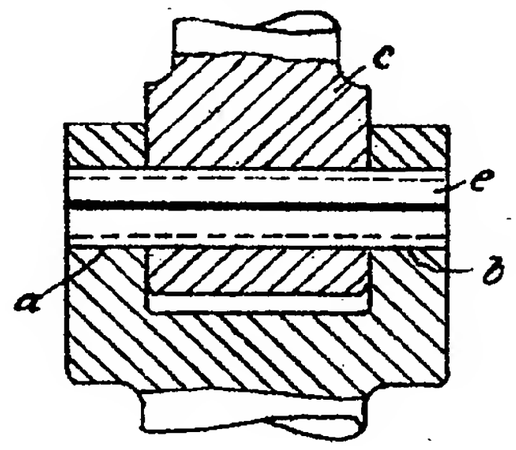

Fig. 3

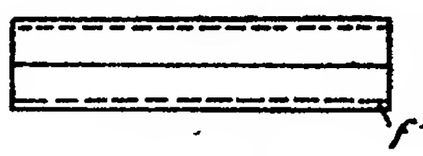

Fig. 4

Fig. 5

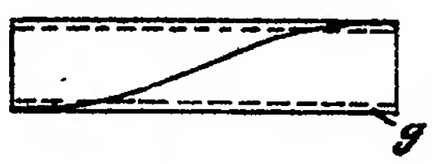

Fig. 6

Fig. 7

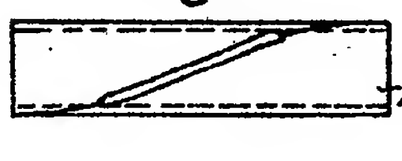

Fig. 8

Fig. 9

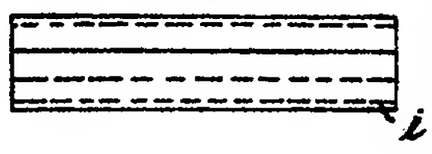

Fig. 10

Fig. 11

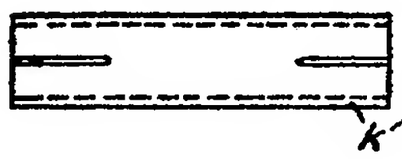

Fig. 12

Fig. 13

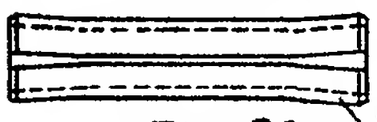

Fig. 14

Fig. 15

Fig. 16

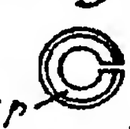

Fig. 17

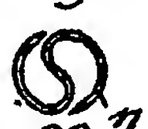

Fig. 18

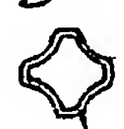

Fig. 19

Fig. 20

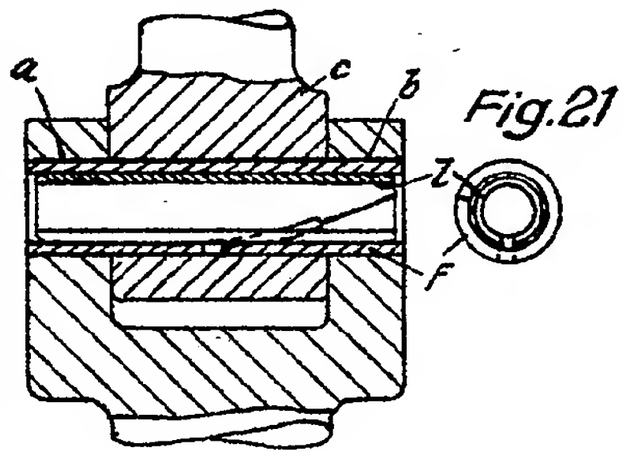

Fig. 21

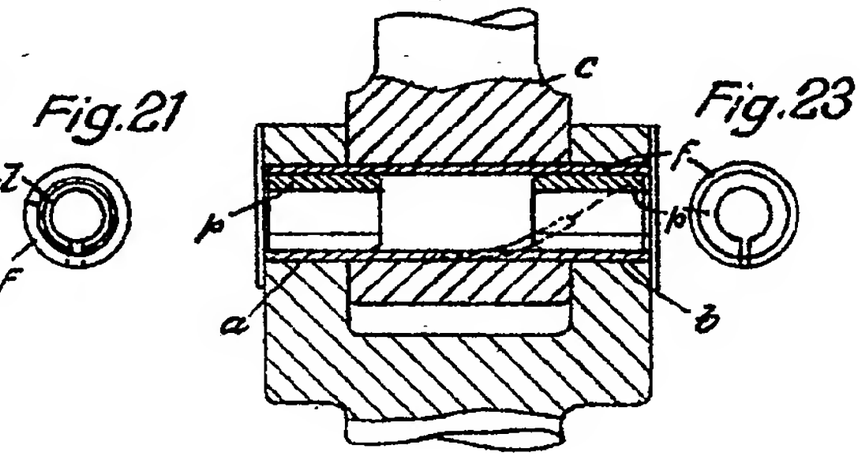

Fig. 22

Fig. 23

Malby & Sons, Photo-Litho